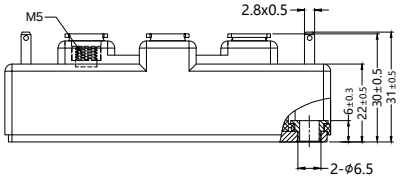
# S4G40T120SC9

## H bridge IGBT modules


Dimension: mm

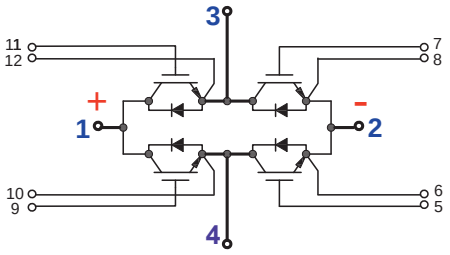


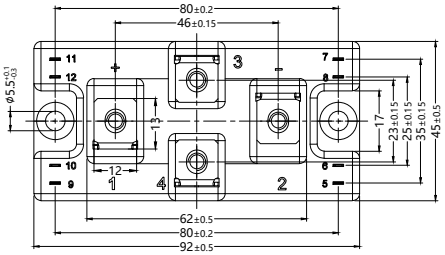

$V_{CES}$ = 1200V

$I_{C100}$ = 4X40A

$V_{CEsat(typ)}$=1.85V

$E_{off(typ)}$ = 1.4mJ




| Absolute Maximum Ratings | | | | |
|---|---|---|---|---|
| **Symbol** | **Test Conditions** | | **Values** | **Unit** |
| **IGBT** | | | | |
| $V_{CES}$ | Tj =25°C | | 1200 | V |
| $I_C$ | Tj = 175 °C | Tc =25°C | 80 | A |
| | | Tc =80°C | 40 | A |
| $I_{Cnom}$ | TC = 100 °C Every chip | | 40 | A |
| $I_{CRM}$ | ICRM = 3xICnom | | 120 | A |
| $V_{GES}$ | | | -20 ... +20 | V |
| tpsc | VCC = 800 V<br>VGE ≤ 15 V<br>VCES ≤ 1200 V | Tj =150 °C | 10 | µs |
| $T_j$ | | | -40 ... +175 | °C |
| **Inverse diode** | | | | |
| $I_F$ | Tj = 175 °C | Tc =25°C | 40 | A |
| | | Tc =80°C | 20 | A |
| $I_{Fnom}$ | | | 40 | A |
| $I_{FRM}$ | IFRM = 3xIFnom | | 120 | A |
| $I_{FSM}$ | tp = 10 ms, sin 180°, Tj =25°C | | 90 | A |
| $T_j$ | | | -40 ... +150 | °C |
| **Module** | | | | |
| $I_{t(RMS)}$ | Tterminal =80 °C | | 200 | A |
| $T_{stg}$ | | | -40 ... 125 | °C |
| $V_{Isol}$ | AC sinus 50 Hz, t = 1 min | | 4000 | V |





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# S4G40T120SC9

## H bridge IGBT modules

| Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | **Test Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| **IGBT** | | | | | | |
| $V_{CE(sat)}$ | $I_C$ =40A<br>$V_{GE}$ =15V<br>chip level | $T_j$ =25°C | | 1.85 | 2.10 | V |
| | | $T_j$ =150°C | | 2.10 | 2.30 | V |
| $V_{CE0}$ | chiplevel | $T_j$ =25°C | | 0.8 | 0.9 | V |
| | | $T_j$ =150°C | | 0.7 | 0.8 | V |
| $r_{CE}$ | $V_{GE}$ =15V | $T_j$ =25°C | | 14.00 | 16.00 | mΩ |
| | chiplevel | $T_j$ =150°C | | 21.00 | 22.00 | mΩ |
| $V_{GE(th)}$ | $V_{GE}$=$V_{CE}$, $I_C$ = 1.7 mA | | 5 | 5.8 | 6.5 | V |
| $I_{CES}$ | $V_{GE}$ =0V | $T_j$ =25°C | | | 1 | mA |
| | $V_{CE}$ = 1200 V | $T_j$ =150°C | | | | mA |
| $C_{ies}$ | $V_{CE}$ =25V<br>$V_{GE}$ =0V | f=1MHz | | 2.70 | | nF |
| $C_{oes}$ | | f=1 MHz | | 0.17 | | nF |
| $C_{res}$ | | f=1MHz | | 0.09 | | nF |
| $Q_G$ | $V_{GE}$ = - 8 V...+ 15 V | | | 270 | | nC |
| $R_{Gint}$ | $T_j$ =25°C | | | 4.0 | | Ω |
| $t_{d(on)}$ | $V_{CC}$ = 600 V<br>$I_C$ =40A<br>$V_{GE}$ =±15V<br>$R_{G\ on}$ =1Ω<br>$R_{G\ off}$ =1Ω<br>$di/dt_{on}$ = 1700 A/µs<br>$di/dt_{off}$ =670A/µs | $T_j$ =150°C | | 55 | | ns |
| $t_r$ | | $T_j$ =150°C | | 39 | | ns |
| $E_{on}$ | | $T_j$ =150°C | | 3.3 | | mJ |
| $t_{d(off)}$ | | $T_j$ =150°C | | 265 | | ns |
| $t_f$ | | $T_j$ =150°C | | 30 | | ns |
| $E_{off}$ | | $T_j$ =150°C | | 1.4 | | mJ |
| $R_{th(j-c)}$ | per IGBT | | | | 0.58 | K/W |



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# S4G40T120SC9

## H bridge IGBT modules

| Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | **Test Conditions** | | **min.** | **typ.** | **max.** | **Unit** |
| **Inverse diode** | | | | | | |
| $V_F = V_{EC}$ | $I_F$ =20A<br>$V_{GE}$ =0V | $T_j$ =25°C | | 1.90 | 2.54 | V |
| | chiplevel | $T_j$ =150°C | | 2.08 | 2.60 | V |
| $V_{F0}$ | chiplevel | $T_j$ =25°C | | 1.3 | 1.5 | V |
| | | $T_j$ =150°C | | 0.9 | 1.1 | V |
| $r_F$ | chiplevel | $T_j$ =25°C | | 18.0 | 20.0 | mΩ |
| | | $T_j$ =150°C | | 25.0 | 28.0 | mΩ |
| $I_{RRM}$ | $I_F$ =20A<br>$di/dt_{off}$ =1380A/μs<br>$V_{GE}$ =±15V<br>$V_{CC}$ = 600 V | $T_j$ =150°C | | 20 | | A |
| $Q_{rr}$ | | $T_j$ =150°C | | 8.0 | | μC |
| $E_{rr}$ | | $T_j$ =150°C | | 3.0 | | mJ |
| $R_{th(j-c)}$ | per diode | | | | 0.88 | K/W |
| **Module** | | | | | | |
| $L_{CE}$ | | | | | 30 | nH |
| $R_{CC'+EE'}$ | terminal-chip | $T_C$ =25°C | | 0.65 | | mΩ |
| | | $T_C$ =125°C | | 1 | | mΩ |
| $R_{th(c-s)}$ | per module | | | 0.04 | 0.05 | K/W |
| $M_s$ | to heat sink M5 | | 3 | | 5 | Nm |
| $M_t$ | | to terminals M5 | 2.5 | | 5 | Nm |
| | | | | | | Nm |
| Weight | | | | | 170 | g |



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# S4G40T120SC9

## H bridge IGBT modules

### Features

• Trench Field Stop technology
• Ultra fast free wheeling diodes technology
• Low switching losses
• Switching frequency up to 20KHz
• Positive temperature coefficient for easy parallelling
• MOS input, voltage controlled

### Application

• AC and DC motor control
• AC servo and robot drives
• Power supplies
• Welding inverters

### Advantages

• space and weight savings
• reduced protection circuits

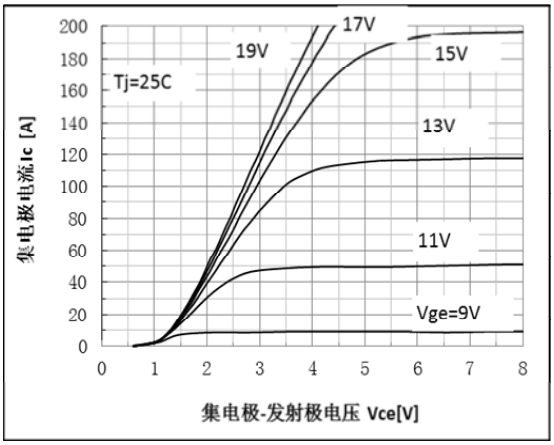


Fig.1 Output characteristic curve

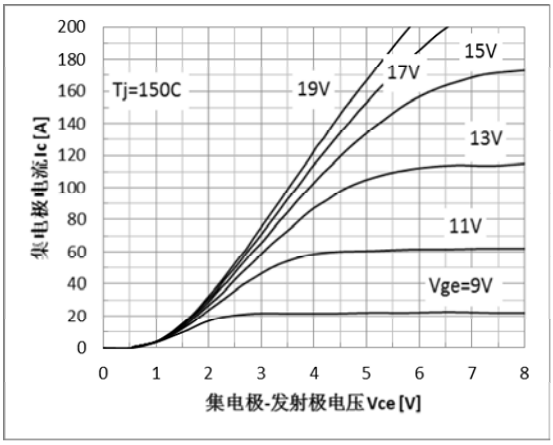


Fig. 2 Output characteristic curve

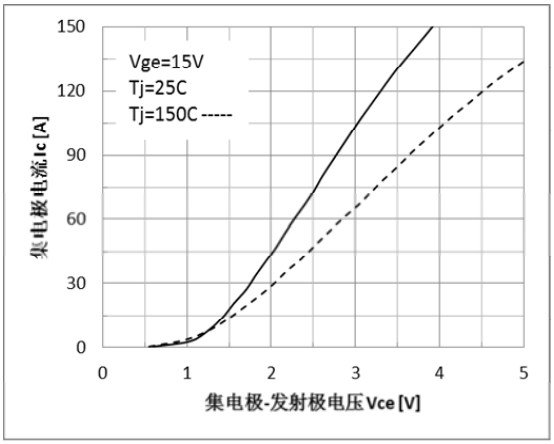


Fig.3 Saturation pressure drop characteristics

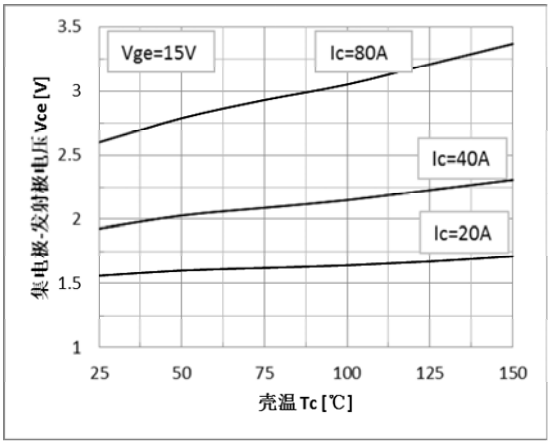


Fig.4 Saturation pressure drop temperature characteristics



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## H bridge IGBT modules

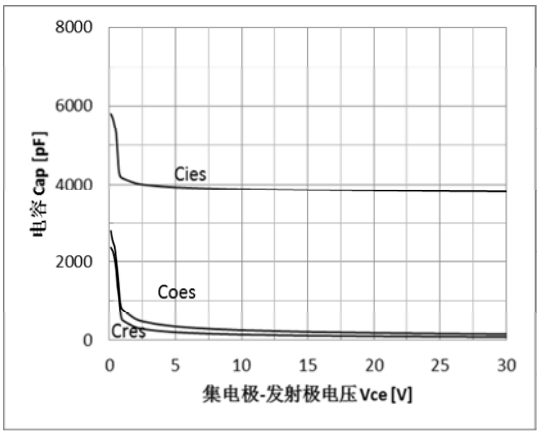


Fig.5 Capacitance characteristics

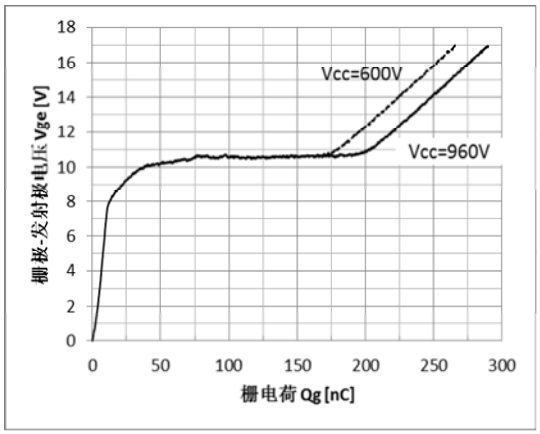


Fig.6 Gate charge characteristic

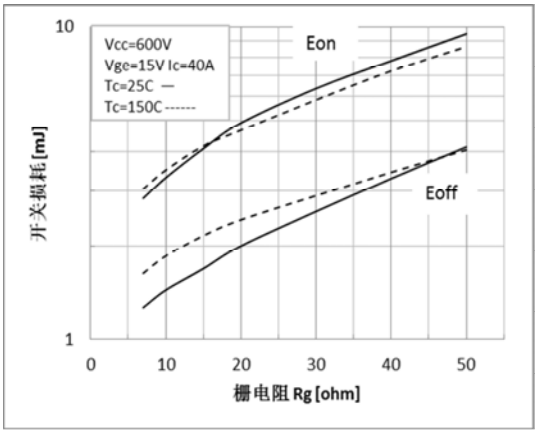


Fig.7 Switching loss - gate resistance characteristic curve

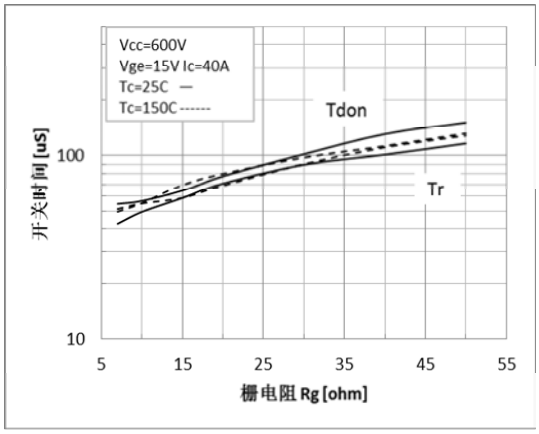


Fig.8 Turn-on - gate resistance characteristic curve

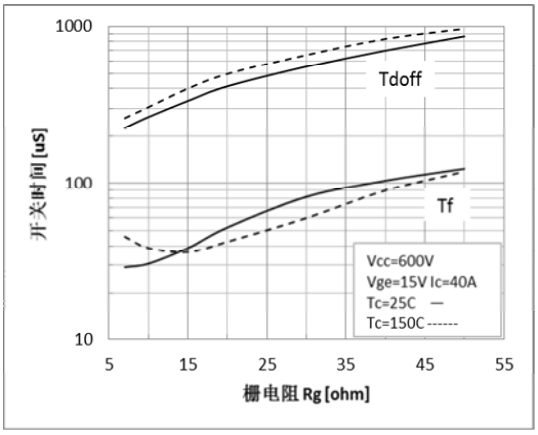


Fig.9 Turn-off - gate resistance characteristic curve

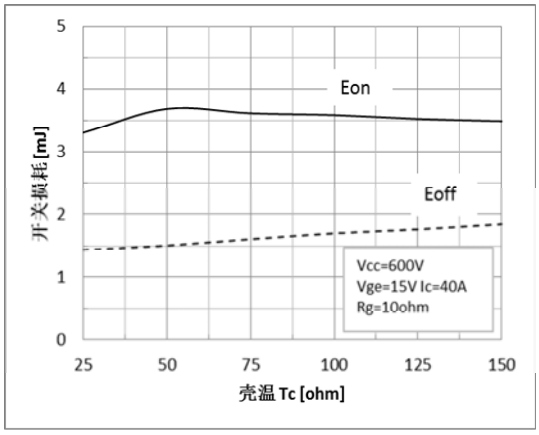


Fig.10 Temperature characteristics of switching losses



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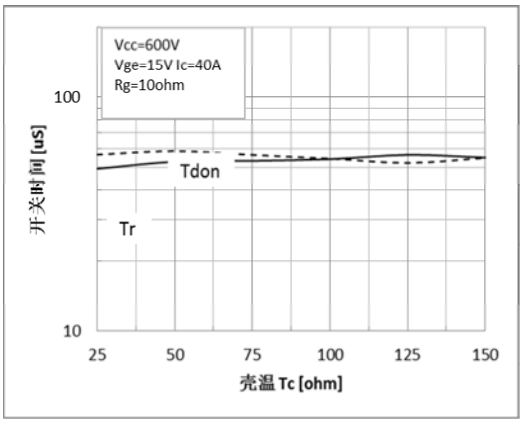


Fig.11 Turn-on temperature characteristics

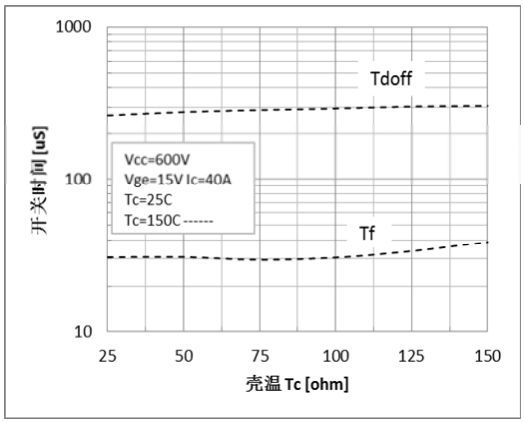


Fig.12 Turn-off temperature characteristics

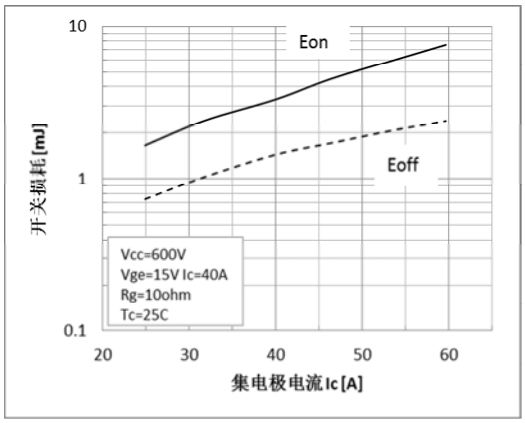


Fig.13 Switching loss and current characteristics

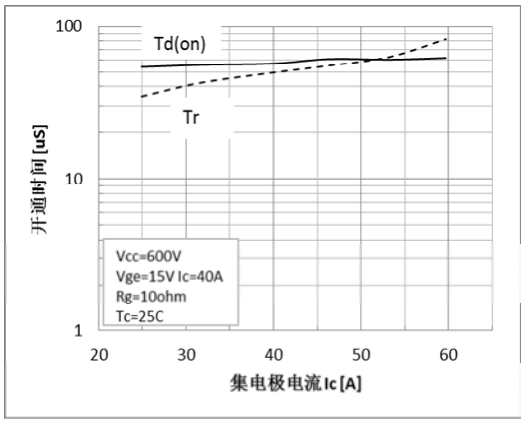


Fig.14 Turn-on and current characteristics

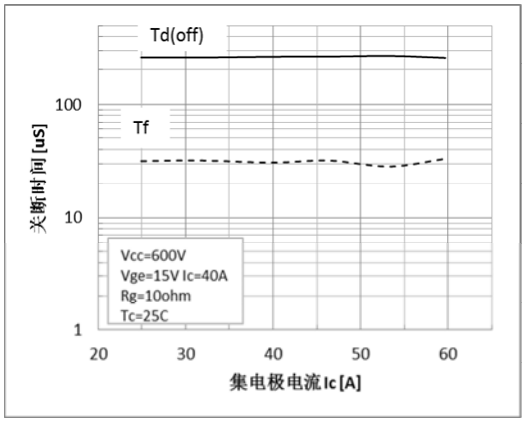


Fig.15 Turn-off and current characteristics

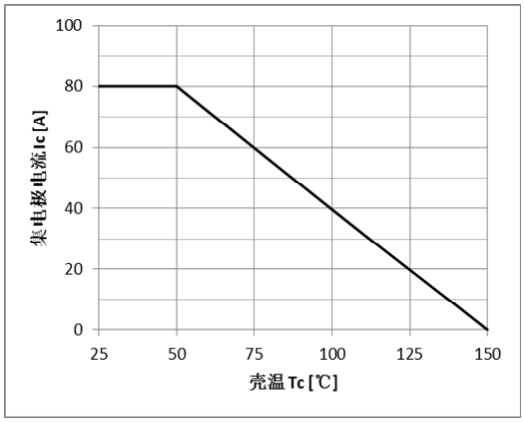


Fig.16 Collector current-temperature characteristics



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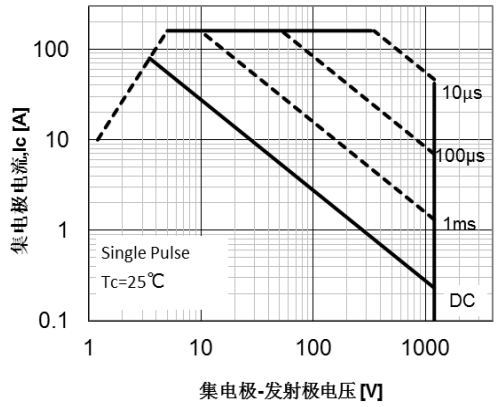


Fig.17 Forward Safe Workspac

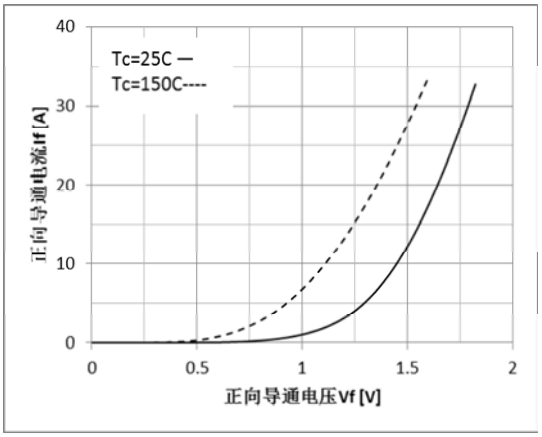


Fig.18 Forward characteristics of the diode

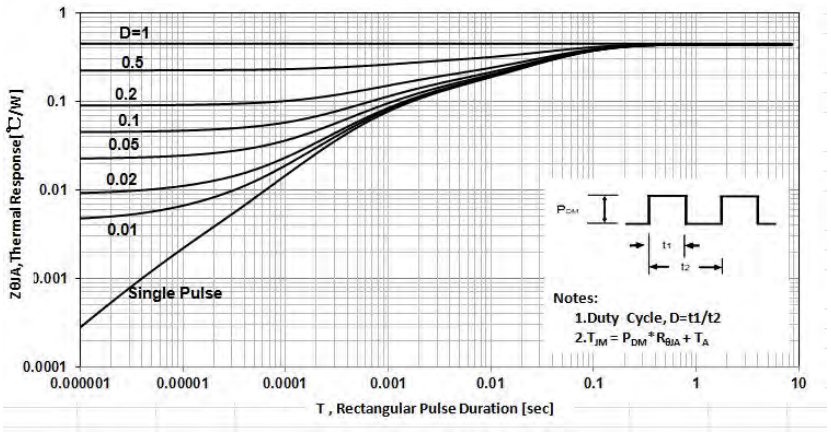


Fig.19 Transient thermal resistance characteristics



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